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ABSTRACT

Patterns of assistance in parent-child dyads were examined by developing measures that could be used to explore the nature of assistance and learner action sequences. A microgenetic approach was adopted in a teaching experiment that may be regarded as a variation of the double stimulation method of L. S. Vygotsky. A second goal was to explore the blending of quantitative, multivariate methods with interpretive methods in advancing the cultural-historical (CH) model. Thirty-two fourth to sixth graders and their mothers from the United States and 32 such pairs from Peru were studied. Parent-child problem solving activity was observed in a laboratory setting where interactions during a categorization task were videotaped. In one study process measures were the focus and in another assistance patterns were examined as a function of children's developmental level, analyzing the relationship between negotiation in the children's zone of proximal development and resulting assisted responses. Findings suggest that the factor score for a given dyad is a prevailing characteristic of a given family setting. Interaction patterns were moderately correlated with a distant measure of development. The combination of research methods is useful in understanding the nature and nurture of cognitive environments. Three tables present study findings. (SLD)

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Parent Child Interaction Patterns in Dyadic Problem Solving: An Application of Vygotsky's Double Stimulation Method

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Introduction

Teaching interactions that occur in children's ZPD appear to be of increased theoretical interest from what has been recognized as a socio-cultural or cultural historical research framework. A number of recent studies have examined interaction characteristics of assistance or scaffolding through content analysis and/or quantitative analysis of relevant interaction measures(e.g.,Diaz, Neal & Amaya-Williams, 1991; Laosa, 1981; Portes, 1988; Rogoff, 1984; Wertsch Minick and Arns, 19xx, Rogoff & Wertsch, 1984 and others). Some of these studies have examined aspects of culture indirectly through measures of socio-economic status, ethnicity and gender. A central concern in these studies has been the relation of cognitive socialization practices and their implications for understanding differences in areas of academic and social competence.

A cultural research framework requires an ontogenetic analysis of the relation between culture and the human mind. It must focus particularly on "how" socialization processes influence not only intellectual performance but the development of competence in other areas that may vary in compatibility between school and natal/family environments. The main foundations for the cultural-historical (CH) framework stem directly from Vygotsky's (1987) conceptual and methodological (see Davydov & Radzikhovskii, 1984) structuring for a broad psychology that links culture to complex psychological functions.

Interest in scaffolding (Wood, Bruner and Ross, 1976) or assistance (Tharp & Gallimore, 1988) has led to genetic studies in teacher-student and parent-child interactions that employ a truly developmental focus afforded by the CH model. The model stresses the role of mediational tools in accounting for development, particularly the transition between simple and complex psychological functions. The relations examined by cultural-historical analysis center on qualitative changes in human cognition from an evolutionary perspective (phylogenesis), from a socio-cultural and historical standpoint (socio-genesis), and most importantly for educational psychology, from ontogenetic

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changes brought about by transfer or decontextualization of mental tools and signs in learning experiences (microgenesis). These three basic domains account for the development of higher order intellectual functions and each one implies different explanatory principles (Wertsch, 1985b). Of particular interest in the present study is the latter, ontogenesis, in helping us understand the actual mechanisms that propel change in children's cognition.

Change is influenced directly by conditions that allow for "decontextualization" (Wertsch, 1985) or distancing (Sigel, 1985) in the learner's experimentation with new tools and signs. Those conditions are found in socialization activities provided in community and family settings, ranging in origin from patterns of speech and word meanings to the modeling of complex executive routines. These conditions are influenced by socio-historical conditions that lend structure to the acquisition of mediational means or tools. From this perspective, school achievement differences may be understood most clearly then in terms of those conditions that limit or facilitate the acquisition and decontextualization of mental tools and concepts required for success in that setting.

School achievement's relation to cognitive development can be understood to a large extent by examining the cultural history and patterns of interaction that form children's minds. It is interesting that it is only after the development of language that group differences in school learning are evident. Yet, the complexities of first language acquisition are as intellectually demanding as any of those required later in formal schooling. What becomes puzzling then is how many biologically normal children, who are proven "linguists extraordinaire" and competent cognitively, (regardless of cultural background before schooling), fail to construct the meanings valued in school adequately. They fail to achieve as well, and as fast as others, and in ways that soon become associated with social background. Interaction patterns in the family may be regarded as strategic mediating processes that are of particular interest in this study. These patterns may be viewed as a "carrier wave" (Dunham, Kidwell & Portes, 1988) or signaling system that escorts children's development and that may underlie both group and individual differences. However, in spite of the many fine studies describing teaching interactions in the ZPD, their components and characteristics, a major problem in this areas has been that these descriptions produce rather static results that remain focused on performance rather than development.

Theoretical & Methodological Issues

In the past, group and individual differences have been regarded as a product of different environmental or biological processes. Human behavior has been studied in the context of various treatments or conditions and the results are typically

approached as "fossilized" characteristics (Vygotsky, 1978). However, research on how individuals shape their own development by utilizing culturally-mediated tools to create meaning has not been a focus in current psychological or educational research. Neither has the focus been on the study of individual development within groups as each unit of analysis, comprised by the individual with "a culture kit" (Wertsch, 1991), responds to the practices organized by schooling.

The cultural-historical (CH) view of development suggests that many of the individual characteristics related to learning, (e.g., personality, identity, motivational or affective characteristics) require study in their very process of change. The historical approach to the study of mind is described most accurately by Valsiner (1990) who notes;

> "The "historical" portion of the label cultural-historical refers specifically to the developmental nature of all psychological phenomena. Note that in this context, the term has little in common with the more traditional meaning relating to past events. In cultural-historical thinking, historical implies the connection between past, present and future.
> ...in cultural-historical thinking, individual human beings are considered to play an active role in their (as well as others') psychological development. Previous psychological schools attributed causality to the environment ("Nurture") or to inborn and predetermined "essences" in individual persons ("Nature"). In either case, the person was believed to play a passive role- as the target of environmental stimulation in the first case or as the "vessel" within which nature's causal essences unfold in the second case. In contrast, cultural-historical thinking emphasizes the instrumental function of the person, who, by acting upon his or her environment with the help of tools or signs, changes his or her development. Note that in this case cultural means "instrumentally created" and is different from the way in which the term is used in contemporary cross-cultural psychology--that is, meaning "specific to a certain group of people who make up a culture" (p.60).

This cultural-developmental model thus requires a novel way of approaching the study of mind as well as many educational problems. A person constructs certain word meanings, strategies or intentional plans in attempting to make sense of the immediate context. The construction takes place conjointly with assistance from others who provide means, model strategies or share meanings that become instrumental for the learner in achieving particular goals or understanding. Co-construction with the use of cultural tools or means defines and guides mediated action (Wertsch, 1991). These means are employed instrumentally by individuals to

shape their future development. If group differences in socialization exist, advantages or difficulties can be examined in terms of mediated action. We may ask "what means are present in mediating the competencies, learning readiness, and the motivation of individuals?". At the group level, we may ask "how are psycho-cultural variables involved in the shaping of activity settings that, in turn, allow for analyses of mediation?" (Tharp, 1989). What are the instrumental actions or functions carried out by the individual that, with decreasing assistance, permit alteration of the future? And, what forms of assistance seem to afford the most help in generalization and transfer by the individual?

Traditionally, the "learning history" of the individual is used as an explanatory principle that in the CH school, concerns the cultural line of development. Differences in exposure to a variety of cultural tools is only part of the answer. Although operant learning includes the concept of instrumentality, it does not account for the acquisition of higher psychological functions. Nor do differences in cultural knowledge, which includes a broad array of cultural tools, account fully for within group differences in mastering new cultural knowledge. Similarly, individual differences, which are related to the natural line of development, do not account for learning or achievement gaps associated with educational failure. In fact, elementary mental functions associated with the natural line of development may actually represent the universal or "culture-free" foundations for cultural development. The interaction between these two lines, however, provides a potential answer to the above problem and paves the way for a new unit of analysis. This interaction is dynamic and is included in a new definition of agency by Wertsch and Tulviste (1992);

> ...one cannot derive an adequate account of mediated action by focusing either on the mediational means or on the individual or individuals initiating and carrying our action in isolation. Instead, both components are inherently involved in such a way that agency is defined as "individual(s)-operating-with-mediational-means" (Wertsch, 1991: Wertsch, Tulviste, & Hagstrom, in press). This account allows for innovation because each concrete use of mediational means by individuals involves some differences from other uses. Indeed, the individual use may vary quite radically from previous uses. On the other hand, however, mediated action is always constrained in certain fundamental ways by the fact that existing cultural tools are used. As a result, any creativity that occurs involves the transformation of an existing pattern of action, a new use for an old tool (p.555).

The CH approach addresses processes of development through which environments influence cognition through important concepts such

as activity, verbal mediation, zones of proximal development, micro- and socio-genesis, internalization, intersubjectivity, voices, word meanings and verbal regulation of thought. In the CH model, group membership as well as institutions may be regarded as organizing development through activity patterns involving particular cultural tools (mediational means) and through the creation and advancement of zones of proximal development (ZPD). Individuals may be advantaged or constrained by the nature of activities in their cognitive environments which influence the degree to which, and type of, tools and signs that are employed in that or another setting. Yet, they are free to alter their development to the extent to which they act upon the environment with new mediational means.

One final point regarding CH thought concerns both Kurt Lewin and Lev Vygotsky's emphasis of historical (developmental/process) analysis as an indispensable methodological tool. Although some longitudinal studies exist, these rarely provide the kinds of data pertinent to ontogenesis or utilization of mediational means. For Vygotsky, the study of development, which includes learning, was the heart of psychology. As Valsiner notes, "He advanced the general methodological canon for psychology: Only when psychological phenomena are viewed in their process of change can they be adequately explained" (Valsiner, 1990, p.61).

Methodological Implications of the CH Approach

A still relevant methodological approach proposed by Vygotsky was the double stimulation method, one which is aimed at uncovering development of new psychological capabilities as these are transferred from the interpsychological plane to the intra-psychological one. This method could be viewed as the cognitive equivalent of the S-R, R-S and social learning behavioristic paradigms but one that unfortunately has not received much attention in the West.

This method may be understood as a paradigm where the subject is placed or finds herself in a problemsolving situation and where some means or tools are available with which a solution could be reached. These means or stimuli are originally in a neutral or latent state. They dwell initially outside the person's actual level of development (AZD) in the sense that their connection in solving the task has not been made intramentally before. The restructuring of the task that occurs in the ZPD often involves an action sequence where the subject selects and then converts some neutral stimuli into a stimulus-means, which is then used to achieve a solution. This process has not been studied as much as scaffolding patterns which focus primarily on describing means of assistance (Tharp & Gallimore, 1988) or distancing (Sigel, 1989) or parent-child interaction styles (Portes, 1991; 1988). While such research is valuable, it is not developmental nor revealing about ontogenesis. For a study to be truly developmental, the unit of analysis must be subjective as well as objective. The

subjective refers to aspects of the problemsolving situation where, in a Wertschian sense, the person is now acting-with-mediational-means". This "semiotic uptake" (Wertsch and Stone, 1985; Minick, 1978) becomes historically irreversible in the structuring of mind. The new means become internalized and cause change externally. This may be inferred from a new capability that did not exist before.

The double stimulation method is important in that "it creates the conditions under which a subject's course of action toward an experimentally given goal makes explicit the psychological processes involved in that action" (Valsiner, 1990, p.66). Double stimulation accounts for the processes that allow the individual to "make history" in the sense of mastering a concept or solving a problem, thus modifying the present into the past or bringing the future into the present. As Valsiner (1990) notes, the dependent variable is not an outcome but rather the action sequence that leads to such outcome. The research question is different and requires a focus on the change process itself. How the person constructs a new understanding of the problem and comes to employ a new (semiotic) tool in dealing with an environmental demand becomes the object of study.

Double stimulation allows for a closer examination of the precursors of, or conditions, in the converting process by the individual. This process is often regarded as appropriation, internalization or simply, acquisition of knowledge. The method helps shed light on the ways that newly acquired and perhaps unstable concepts or skills become stable or "fossilized". And in sum, the focus on the very mechanisms of intramental change in developmental research requires attention to social conditions and external assistance that are part of teaching/learning.

Although this method was proposed during the first part of the century, research based on this methodological paradigm is practically non-existent in the West. This is largely due to the tendency of studies to focus almost exclusively on the description of scaffolding or assistance on one hand, or to focus on the outcomes of the task on the other, or both of these. Studies of teaching interactions frequently overlook existing opportunities to deliberately employ the double stimulation approach to study changes in cognition. The present study addresses this problem by exploring certain action sequences in parent-child problem solving interactions where different forms of assistance by the parent are employed instrumentally by the child in achieving the goals of the task.

The study's framework presents a perspective based primarily on the microgenesis line of cultural development noted by Vygotsky (in Wertsch, 1985b). The social context, through interactions carried out in family, community and school settings, is viewed as structuring the nature and timing of influences on individual

development.

II. Purpose of Study

One goal of our study was to examine patterns of assistance in parent-child dyads by developing sensitive measures that could then be used to explore the nature of assistance and learner action sequences. Although a longitudinal study of how newly acquired means undergo fossilization is unfeasible in the present research design, a microgenetic approach was adopted in a "teaching experiment" that may be regarded as a variant of the double stimulation method. That is, the study attempts to show how children make instrumental use of assistance, relative to how it is provided.

A second goal of the study is to explore how quantitative, multivariate methods can be blended with interpretative methods (Erikson, 1986) in advancing the CH model. In the present case, the former are used to show how they help "pave the way" for the latter by uncovering certain relationships in the data and the reciprocal nature of meaningful actions in dyadic interaction.

METHOD

Overview

In this study, a fifth grader, in the course of eight consecutive categorization tasks where the assistance of a parent is made available, responds initially with functional responses to the task structure,-"what do these stimuli have in common?". Although the stimuli vary, the responses may reveal mostly a "set" for relational answers such as " with the ax or saw you can cut the log". The mother notes " they all have some wood" referring to the handles of the tools and log. The child then says "these three (household tools) have metal". The mother ends the first task with " Good! and also, these three (points) are all tools". In subsequent tasks, the child begins "to see" more abstract categories such as " all are means of communication", in a subsequent task that is similar ("What do these (radio, book, magazine, newspaper) have in common? and so on). The child may be said to have internalized a maternal stimulus and converted it to a stimulus means which is evidenced through the rest of the tasks (Portes, 1991). The double stimulation method approach in this study thus may be regarded as setting up a situation where parents' assisting behavior may be regarded as stimulus means. Parental assistance varies in intersubjectivity, in their overall quality and timing in relation to the child's own actions and ZPD. A number of case studies from an earlier study (described below) were employed in an application of double stimulation.

PROCEDURE

From a sample of 64 fourth to sixth grade school children and

their mothers (32 from Peru and 32 from the U.S.), twenty cases from the U.S. were selected for qualitative analyses. These are presented in the second part of the study where assisted performance in the categorization tasks was analyzed. As background for the latter, the contrast of 32 cases from Peru and 32 cases from the U.S. will be presented first. The sample was formed using an approach designed to balance the volunteer sample by SES, gender and achievement level (Portes, 1988). Parent-child problemsolving activity was observed in a laboratory setting where interactions were videotaped. The problems stem first from the Block Design task (Weschler, 1944) and eight categorization tasks followed. The categorization tasks that followed the joint Block Design task were four sets of pictures on 3x5 cards (pen, pencil, chalk, eraser: ax, saw, hammer, wood: (drinking) glass, pitcher bucket, plate: cow, llama, bear, frog) and four sets of words (newspaper, magazine, radio, book etc...).
At the beginning of the categorization tasks, the instructions were given "to group cards according to the basis of what they may have in common". Subjects were told they could form as many groups as they would like and reminded twice that "mother can help at any time". For the block task, standard instructions and practice were also provided with the variation that "mother can help at any time" instruction. Mothers were prompted if necessary when child remained unassisted twice after which time, experimenter cues were registered in coding.

Coding Method
A three stage approach was employed that is contained in a coding manual presently under preparation.
A) One trained judge transcribed and coded 32 Peruvian interviews into thirty categories described in an earlier report (Portes and Cuentas, 1991; Portes, 1988). These categories were designed to reflect metacognitive guidance, modeling, feedback, reinforcement, questions and other task oriented mother-child interaction characteristics.
B) Another trained rater team of two students also rated the transcribed interviews independently which were examined for discrepancies. Each of these discrepancies was checked against the protocol of the first judge. An initial reliability check was performed between the first judge and the combined team (which averaged, across all categories .72 in eight cases taken at random.
c) Each of the disagreements resulting from the above step was traced back to the transcribed protocol by the first judge and resolved for subsequent analysis.
d) In the final stage before entering the data for analysis, a judge randomly selected six cases and coded 10 (numbered) utterances for mother or child (every 20th in the protocol) and checked it against the first judge's scored coding sheet.
The number of agreements were divided by the number of agreements and disagreements and produced a reliability coefficient of .87. The disagreements were resolved and entered for analyses with the

remaining 26 cases.

Measures in Study I

The variables examined were process measures described in Table I, including 6 "outcome" measures of the block design total correct and the number of relational and categorical responses by mother and child. The process measures were open and closed questions by mother, child agreement with mother, demand for additional information, consulting the experimenter for clarification, imperatives, verbal and/or physical assistance or guidance, reinforcement as well as questions , interruptions, positive reinforcement by mother and humor.

The outcome measures were the total correct for the block design and the number of categorical responses that were defined as responses that had something in common (pseudoconcepts included). Functional or relational responses such as "the ax cuts the wood" were coded separately.

Achievement was also examined based on school performance records. Because grades in Peru are not standardized, the average point value for all courses in the last school year was used as a proxy for the child's intellectual achievement score. Peru uses a 20 point system with 19-20 as A, 17-18 as B, 13-16 C 10-12 D 0-10 F. The grades were converted to normal curve equivalents so that the total sample (N=32) could be employed in some analyses.

Data was also collected regarding parental education, occupation, income, family size, ethnicity and gender for subsequent analyses.

ANALYSES for Study I

An exploratory factor analysis was carried out for both the U.S. and the Peruvian sample based of the measures selected on the basis of their relation to intellectual performance in school. A total of 10 process measures and derived composites were selected (on a conceptual basis) since factor analysis requires a minimum of 5 cases per variable to be factored and because of their average or above average reliability. A principal components factor analysis method was employed to examine potential similarities in factor structure across culture. School performance was used as a proxy for intellectual development, along with independent performance on the categorization and block tasks. Correlation analyses were conducted to explore the relation between factor scores and both performance and static measures. In the last step, Factor scores were subjected to an Analyses of variance by ethnicity, SES, and gender.

RESULTS of Study I

An exploratory principal components factor analysis was employed to uncover the underlying structure of the interaction measures. A rotated varimax two factor solution was selected on the basis of Scree-test (Cattell, 1966) criteria with respect to simplicity of structure, communalities and parsimony. With the Peruvian and

the U.S. samples combined, the first factor loaded most highly with maternal regulation through questions (as opposed to verbal and non-verbal cues, imperatives etc. as might be expected). This factor accounted for near 55% of the variance with an eigenvalue of 3.83. The composite measure ASSIST (.93) ranked second in importance and consisted of strategic guidance by the parent through a combination of open questions and verbal cues. It was followed by maternal control (.88) which was operationalized by imperatives, closed questions and cues that combined verbal and non-verbal cues or assistance. This factor was labelled Adult Controlled Interaction (ACI).

The second factor reflected as style of interaction labelled Child Negotiated Interaction CNI, which emerged with an eigenvalue of 1.8 and increased the variance accounted for to .80 per cent (see Table 1). This factor reflected a pattern of interaction led by child refusal of maternal help, and interruption of her. This occurred in relation to mothers initiating the task, attempting to establish control by non-verbal cues and outright responses that answered the task demands. The latter reflect low intersubjectivity but perhaps a modeling function as well. This interaction pattern also included non-task related general comments and joint expressions of confidence. The last test or composite reflected a strong link to maternal reinforcement, and child agreement over the experiment in relation to mutual disagreements, correction and expression of dissatisfaction with the other persons action in general, COOPRES (.94). In effect, this second factor represents a more participatory, reciprocal style than the first in which the child is more passive.

It was predicted that since the first ACI style of interaction appeared to fall outside children's ZPD in contrast with the second factor, the ACI style, for the most part, should show low and insignificant correlations with our rough (measured at a pseudo-interval level) estimates of school achievement and task performance measures, both 'fossilized' aspects of development. Based on the earlier study with the U.S. sample, it was also predicted that the higher achievers would have lower factor scores (that reflect their space on the style of interaction continuum) than the norm, again suggesting a curvilinear relationship. Finally, ethnic and gender differences were not predicted since separate, earlier analyses (Portes, 1991) suggest that other interactions measures are required to differentiate between these groups. That is, evidence of strong cultural differences were evident but these were not related to intellectual performance.

To examine these questions, factor scores were derived for each of the 64 parent-child dyads. These scores reflect a dyads location in the space that characterizes the factor patterns (ACI & CNI). These scores were analyzed in the context of children's

problems independently which led to categorical responses being coded. This accounts, perhaps, for the loadings associated with the child variables in the second factor. This type of assistance was characterized with parents who attempted to "take over" the task, viewing it less as a teaching opportunity. Instead, some grew impatient and attempted to move the child through to show the experimenter "she knew what to do". They initiated the task and finished it but the child "hung in there" and signalled the mother to not help so much.

Some dyads had a difficult time, with parents who were often unable to contribute to the task. This may reflect that parts of the problem (abstractions) were outside the ZPD area of the parent (defined as the distal zone of development AZD). In these cases, children struggled and some often demonstrated competence autonomously. Still for other patterns or "scripts" (Tharp & Gallimore, 1988) noted, some dyads were well balanced, with high intersubjectivity and the parent holding back until sensing when to assist through a variety of means. They tended to do so that through clear examples of proleptic understanding. They both had fun, expressed confidence and laughed more in response to the experimenter.

On the other hand, many of the low achievers tended to have mothers who assisted less, and less strategically by working within what the child already knew. In these cases, children were left to their own devices and received "inaccurate", or less helpful assistance, making the task long and gruesome.
Finally in one case not employed in the above analysis the mother was monolingual in Qechua and had been assigned a Spanish interpreter. She looked like the child's grandmother and had experienced poverty. Her child proceeded with no assistance in the scaffolding or metacognitive sense, except for encouragement and verbal/nonverbal reinforcement. The child's performance was on par with the rest of the sample, showing mostly the unique effect of schooling. Many children in the sample were not far from this situation with schooled parents.

STUDY II Double Stimulation Method - Theoretical Pursuit

The second study examines the above quantitative findings and assumptions by exploring how assistance patterns may vary as a function of children's developmental level, that of the parent as well as the parent's style of assistance. The relation between negotiation in children's ZPD and the resulting assisted responses is also analyzed. The strategy was to locate a sample of assisted responses where evidence that the child had employed maternal responses (stimuli) instrumentally and consequently, produced a categorization. From that point, the preceding interaction leading to that "semiotic uptake" (Stone, 1989) or appropriation by the child was scrutinized by listing out the interaction measures involved.

actual zone of development (AZD), school achievement and the outcomes of the teaching experiment. Table II presents data confirming a low correlation between school achievement and task outcomes, and the ACI factor. As expected, the CNI factor was related to the task outcome measures (r = .28 with total of correct responses on the block design and children's categorical responses (r = .49). Gender and ethnicity, SES and school achievement level were not significantly related to the MCA factor ($F=.67$, df 5,52 $p > .60$). However, controlling the sample by ethnicity resulted in a clearer picture of the "direction" of the cultural difference(s) noted earlier.

Table II shows lower correlations for the Peruvian sample in the variables of interest than in the U.S. sample in separate factor analyses. Different patterns of interaction measures seem to account for (fossilized) performance for each group. For Peruvian families, the two factors showed an opposite relation to children's categorical performance than for the U.S. sample. The ACI factor had a correlation of -.31 while the CNI factor had a significant .47 correlation ($p < .01$).

For the U.S. sample, the ACI factor showed higher correlations with performance measures, particularly the child's categorical response (r .43, $p < .05$) while the CNI factor accounted for almost half of the variance in child categorization, and less so in the total of block design tasks.

RESULTS & DISCUSSION - Study II -

Given the above background, the search for those few episodes where children's categorization response was assisted was undertaken by a re-analysis of cases and their transcripts. For purposes of the report, only transcripts in English were selected for a score of cases that would be representative of gender and achievement level. Of particular interest in the study was the analysis of assistance means with high achievers (in contrast with average and low achievers) since in an earlier study (Portes, 1988), a curvilinear relationship was found that suggested that overall, a ceiling effect for task difficulty level had been reached for the former group.

Hence an episode for each case was selected (when present) that reflected assisted categorization performance by the child. Relatively few action sequences reflected strategic assistance where parental assistance led to children's internalization of a "means" thas was employed independently in later tasks. Of these, some appeared to take the child away from "higher" level conceptualization down to the lower "relational" level modeled by the parent. Except for the high achievers who appeared to already "have" the means necessary, and who tended to receive less but more strategic assistance, mothers tended to be somewhat insensitive to children's developmental level and to resolve

Findings

The table below summarizes a score of cases where children's categorizations were assisted. As can be noted, the types of assistance indexed by the interaction measures are broken down by school achievement level as a rough measure of children's developmental level. The high achievers appear to have very abbreviated interchanges which suggest a high degree of intersubjecticity and prolepsis. These terms refer to communication that reflects on a common understanding and where there is mutual sensitivity to each other's message. For example, these 3 cases show how a parent helps establish the ground rules by seeking clarification from the experimenter about the goal of the task. Open questions and focusing attention strategically appear sufficient to trigger a child response that is then followed by reinforcement as feedback.

Insert Table 1 about here.

These descriptions of how assistance was provided for all those instances where the child's categorical response was not unassisted vary in somewhat revealing ways. There seems to be more explicitness in the assistance given as a function of intellectual level, as well as more interaction. Each case is unique. For example, the next two groups below show more direct regulation by parents.

Finally, assistance in the lowest level appears to be rather different although this would not be discernable from frequency counts or from the type of interaction measures. The assistance observed in these cases was so explicit that it partly "eclipsed" children's ZPD. That is, it is difficult to surmise if the guidance provided is timely for the parents seem to provide cognitive restructuring (Tharp & Gallimore, 1988) and is left unsure as to whether the child could have proceeded unassisted. The parent sets the parameters and leaves very little room for insightful behavior on the part of the child. Naturally, it is quite possible that these parents are operating with a different script that is deployed primarily on the basis of their understanding of the task goals. One would also have to look at the whole preceding episodes to determine if in fact the child was being denied opportunities to convert the available stimuli into means independently. In some cases too, the child's passivity and seeming impotence to respond triggered the above regulations. Yet, what seemed most clear was the covariation between the child's response patterns and those of the parent and the implication that the present "snapshots" of problemsolving skills were the product of the accumulation of these forms of joint activity.

Finally, only in some cases was there evidence that the assisted responses reflected a "semiotic uptake" where the child was actually converting the external means of assistance into means

of self-regulation. As could be predicted by the brevity of this task situation, only in of these cases was there evidence that the child converted assistance into a "stimulus mean" that was observable in subsequent tasks. This occurred with a high achiever who appropriated his mother's "part/whole" modeled strategy. During a picture categorization task(car, bicycle, train, airplane), the mother's stimulus was " they all have wheels,.....", later in a word categorization task (reptile, cow, alligator, bear), the child responded " all have hair, skin". There was also evidence that in addition to appropriation of such strategies, there were instances where task operations modeled by the parent were later adopted by the child. For example, the mother would verbalize each stimulus presented at the start, and later, the child would start out in the same way, thus helping to focus attention.

Discussion

The present study represents a limited exploration into how parent-child interaction style relates to children's cognitive growth in general. Its focus is not solely on the microgenetic aspect of children's employing specific stimulus means but more on the patterns of stimuli-means observed in this contrived task situation. It represents an effort to describe how parents approach teaching even when some might not understand the demands or expectations present in the tasks in the same way as others. This effort attempts to unpack "assistance means" and even some strategies such as chunking, attention focusing or attribution (McCarthy, 1991) are most relevant to the study of metacognition. It illustrates how the six means of assistance (Tharp & Gallimore, 1988) are distributed in these case studies.

In examining parents' approach, for some, their belief was that this sort of experiment might be of help to their children while others were more aware of their research contribution. Some were clearly in the "habit" of helping their children with homework while others were not. The population "validity" of these findings is undetermined. It is clear that in future studies, closer attention is required about the relation of experimental setting to children's other activity settings in accounting for the role of beliefs, scripts and other factors in these tentative findings.

The question of theoretical significance can be examined in several ways. First, given the assumption that culture mediates mental development primarily through social interaction, one might speculate that family interaction style plays a strong determining role. If so, one would expect a significant relation between the latter and an indirect indicator of mental development,- scholastic achievement. This assumption was supported in general.

Maternal assistance was observed through a variety of means;

verbal cues or directives transmitted repeatedly through imperatives, questions and even mothers "taking over the task" by solving it (modeling or interference perhaps). These were sometimes found to lead to a series of independent elaborations on the part of the child. The parent's utterance was found to be absorbed when self-regulated parallel responses were made by the child later, which were rarely observed within the duration of less than an hour. In other cases, they produced hardly more than a re-statement on the part of the child without transfer observed. In such cases, a mismatch between the child's ZPD and parent regulation might be noted, perhaps a wrong presupposition on the parent's side that intersubjectivity existed when it did not. A relevant question then that may be considered then is "is there a history of such mismatch between the two (where a less than desirable style can be suspect?").

In effect, the present findings may thus be interpreted in favor of the above conjecture (ie., the factor score for a dyad is a prevailing characteristic of a given family setting. Obviously, other observations over time and including both parents in most cases would be needed to confirm this thesis. Nevertheless interaction patterns were found to be modestly associated with a distant measure of development in this study. This suggests that other factors may be operating differentially in influencing intellectual growth across samples and settings.

The above example of internalization and use of a "mother provided" stimulus means represents a microgenetic aspect of the data that requires further attention. This study may be regarded as one which addresses the dialectic between two research traditions. In this case, the groundwork has been laid for interpretative research. Some inroads and perhaps advances in our field would seem to be maximized by further applications of the double stimulation method in focusing on actual development.

As with the Wertsch and Schneider (1979) and Rogoff (1986) studies, some mothers used redundant information (restatements) and shifted back and forth the responsibility for problem solving. Over the many tasks situations observed, what seemed to be an "emerging style" of parental assistance appeared in terms of effective "other-regulation" with intersubjectivity or ineffective assistance characterized primarily by little intersubjectivity. Interestingly, these "emerging" patterns did not prove to be consistent over tasks! What appeared to be an ineffective assistance pattern in one task turned out to become increasingly effective in latter categorization tasks. In spite of considerable within family variability, differences in interaction measures were detectable by level of intellectual performance. Finally, interactions were also found to be differentiated by culture and gender in related studies completed earlier (Portes & Cuentas, 1992).

In the future, greater attention needs to be placed on the ZPD regulations required by verbal concept development tasks and the more perceptual-sensitive block design tasks. However, for high achievers in both cultures, the observed styles tended to be consistent in terms of less quantity of interventions and more strategic types of assistance. A curvilinear relationship was found earlier (Portes, 1988) between interaction style and intellectual performance on achievement tests suggesting that the more advanced the child, the less assistance may be required given the ceiling effect for these tasks. Hence, the level and type of assistance appear to be a function in part, of task difficulty in relation to the intellectual development of the parties involved. By employing the double stimulation method, it was possible to shed light on how assistance occurred in those limited occasions involving high achievers who are developmentally advanced relative to others.

A number of improvements are needed to advance the methodologies required for theoretical validation. It is likely that in the near future we shall see as much attention given to treatment of assessment problems (Analyses of new units of analyses) as to theoretical speculations. Research focusing on referential communication, intersubjectivity and utterances needs to be expanded to various developmental points and in different contexts with more comprehensive measures of mental development present, for both child and parent.

In sum, the present approach attempted to make some plausible interpretations (Bruner, 1990) about cultural context - person interactions that define a more complex unit of analysis for the socio-cultural model. Once ZPD related situations are elicited over a series of tasks, the unit of analysis that may be defined in terms of "how the learner acquires meaning" becomes easier to grasp. In the present study, the findings may be interpreted as part of the five variables defining an activity setting as a unit of analysis (Weisner, Gallimore and Jordan, 1992) that serves to "unpack culture. This will require a blend of both quantitative and qualitative methodologies that are theory driven and descriptive of children's development in relevant settings. The implications of this research, in spite of the limitations imposed by small samples, are significant in understanding the nature and nurture of cognitive environments in relation to children's concept development and the problem of their " Match" (Hunt, 1961).

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TABLE I

Factor Analysis of Dyadic Interaction Measures

Composite	FACTOR I Adult Controlled Interaction (ACI) Loadings	FACTOR I Child Negotiated Interaction (CNI) Loadings
Mother Questions	.94	.04
Assistance M	.93	.00
Control M	.88	.20
Child Independence	.05	.91
Mother Closed Questions, NV Cues/ Models	-.08	.78
Humor, Self-Confidence & Comments	.47	.68
Correction Agrees & Reinforces	.63	.68
EIGENVALUE	3.8	1.8
PCT OF VARIANCE	55%	25%

TABLE 2

CORRELATIONS BETWEEN FACTOR SCORES AND OUTCOME MEASURES IN THE PERU SAMPLE (N=32)

	FACTOR I	FACTOR II
SCHOOL ACHIEVEMENT	.07	.17
BLOCK DESIGN TOTAL	.11	.28*
CATEGORICAL RESPONSES BY CHILD TOTAL	-.09	.49**

CORRELATIONS BETWEEN FACTOR SCORES AND OUTCOME MEASURES IN THE U.S.A SAMPLE (N=32)

	FACTOR I	FACTOR II
SCHOOL ACHIEVEMENT	.31	.20
BLOCK DESIGN TOTAL	.33	.37*
CATEGORICAL RESPONSES BY CHILD TOTAL	.43*	.76**

TABLE III
SUMMARY OF ACTIVITY IN CATEGORIZATION TASKS IN WHICH STIMULI WERE CONVERTED TO MEANS

Interaction Measures (see below for definitions)

Achievement level	1	2	3	4	6	9	13	14	15	16	17	18	19	20	21	23	TTL
HIGH* (n=5)																	
Case 1 (Male)		1										1					2
Case 2 (Female)		1		1				1									3
Case 3 (Male)		1												1			2
(CTBS mean = 96.33)																	7
HIGH-AVERAGE** (n=5)																	
Case 1 (Male)				1	1			1		1		2				1	7
Case 2 (Male)				1	1		1	4								1	8
(CTBS mean = 77)																	15
LOW-AVERAGE (n=3)																	
Case 3 (Male)		3	1	1	1				1	1	1	4	1	2			16
Case 4 (Female)		2	2	1	2			1		1							9
Case 5 (Female)	1	1		1												1	4
(CTBS mean AVERAGE= 55.4)																	29
LOW*** (n=7)																	
Case 1 (Male)													1				1
Case 2 (Female)		1	1														2
Case 3 (Female)													1				1
Case 4 (Female)		2	1	1										1			5
(CTBS mean = 31.5)																	9

* 2 additional HIGH achievers had no "uptakes" noted
** 3 additional HIGH-AVERAGE achievers had no "uptakes" noted
*** 3 additional LOW achievers had no "uptakes" noted

HIGH
Case 1
1. M directs attention physically (points, manipulates)
   M asks open-ended questions/prompts, cues-question form

1. M: (Points to bottle) What about this one?
   C: You could have this one into this one cause you have to pour this (bottle) into the glass. [child relational response]

Case 2
1. M asks examiner for clarification/instruction (about 1/2 way thru)
2. C asks question
3. M asks open-ended questions, prompts, cues-question form

1. M: Do you want us to find as many combinations as we can?
2. C: I don't see where the airplane would quite fit in?
3. M: What about the number of people they carry?
   C: (puts train and plane together) They carry about the same amount of people. [categorical response results from "new" attribute (people they carry)]

Case 3
1. M asks open-ended questions/prompts, cues-question form
2. M uses positive reinf/praise/encour/agreement

1. M: What can they do for you?
   C: They can transport stuff.
2. M: Good!

(Note: One of the few cases in which strategic assistance by the parent actually led to the child's internalization of a "means" for use in subsequent tasks is noted with this HIGH achiever. In Picture Categorization IV, mother cues "they (hammer, ax, saw) all have parts except that one (wood)" which is incorporated by the child and used later in Word Categorization II as the child states "these 3 (zebra, tiger, lion) have parts (tails, ears etc.)" This occurs again in Word Categorization IV where the child reverberates a cue provided by mother ("they all have skin") in Word Categorization II.

HIGH AVERAGE

Case 1
1. M directs attention verbally, cues, prompts
2. Cues by examiner
3. C asks question
4. M directs attention verbally, cues, prompts
5. C agrees with M
6. M interrupts
   General comments or additional information by M

1. M: This one takes your energy, these run on?
   C: This is complicated, to put 'em in one group. I mean, 3 cars, 3 trains...or one or two airplanes in a group. They all can go somewhere...[child categorical response - unassisted]
2. E: What was the last group that your mother was helping you with?
3. C: What about these? (points to two)
4. M: Energy
5. C: Yeah, energy, takes in that and all these (points to 3) and all of these run on engine or. [categorical assisted]
6. M: (interrupts) gasoline
   C: Gasoline or anything else

Case 2
1. General comments or additional info by M; M explains to C
2. General comments or additional info by M; M explains to C
3. C interrupts M
   General comments or additional info by C
4. M interrupts C

M asks close-ended question
General comments or additional info by M; M explains to C
5. C agrees with M
6. M directs attention verbally, cues, prompts

1. M: The turtle and alligator live in the water.
2. M: Sn___
3. C: (Interrupts) If you think of it that way.
4. M: (Interrupts) Snake can too, can't it?
5. C: Uhum (agrees) and turtle.
6. M: Probably all of them
   C: And they all live on land too.
   C: Not live, but sometimes on water and sometimes on land.

LOW AVERAGE

Case 2
1. M directs attention physically & verbally
2. C asks question
3. M directs attention verbally, cues, prompts
4. M asks open-ended questions/prompts, cues-question form
5. M directs attention physically (points/manipulates)
   M asks open-ended questions/prompts, cues-question form
6. C interrupts M
7. M directs attention physically (points/manipulates)
   M asks open-ended questions/prompts, cues-question form
8. M directs attention physically (points/manipulates)
9. M uses positive reinf/praise/encour/agreement
10. M directs attention physically (points/manipulates)
    M asks close-ended question (yes/no or for obvious answer)
11. C agrees with M
12. M uses positive reinf/praise/encour/agreement
13. Cues by examiner (beyond instruction/repitition)

1. M: These 3 can go together (points)
2. C: Why would that be Mom?
3. M: Look at them!
4. M: What do you do with them?
5. M: What do you do with, what do you do with the chalk? (points)
6. C: (C interrupts) Well you draw, you draw with that too.
7. M: What do you do with crayons? (points)
   C: You color.
8. M: (points)
   C: And you draw with this.
9. M: OK
10. M: (Points) Can you draw with crayons?
11. C: Yeah
12. M: OK
13. E: So why would they all go together?
    C: Cause you can draw with all of them.

Case 4
1. M asks open-ended questions/prompts, cues-question form

2. M asks open-ended questions/prompts, cues-question form
3. M asks close-ended question
4. C agrees with M
   C asks question
5. M asks close-ended question
   General comments or additional info by M
6. C agrees with M
7. Cues by examiner

1. M: What do you usually use train, plane for?
   C: Transportation
2. M: Where?
   C: Anywhere.
3. M: You don't take train, plane just to go across the city, do you?
4. C: (agrees) - Car?
5. M: Some use a car, but mostly you use a train or a plane to go on trips, don't you?
6. C: yes (agrees)
7. E: Why do train and plane go together?
   C: You can take 'em on a long trip.

Case 5

1. M initiates task operations/interaction
   M asks open-ended questions/prompts, cues-question form
   M uses humor; makes task fun
2. C asks question

1. M: (initiates) (laughs) Tiger, zebra, lion and alligator, now which one of those doesn't belong?
2. C: Alligator?
3. E: Why is that?
   C: Because it swims.

LOW

Case 1 (Samson
1. M directs attention physically and verbally

1. M: These 2 go together, (pencil/eraser), these 2 go together (chalk/crayon)
   C: Cause you erase lead off paper; and chalk does with crayons

Case 2 (Spalding
1. M asks open-ended question/prompts, cues-question form
2. M asks close-ended question

1. M: How 'bout the vegetables and fruit?
   C: Tomato, carrot and orange.
2. M: Orange is a vegetable?
   C: I mean tomato and carrot and radish.

Case 3

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1. M directs attention physically and verbally

1. M: (points) These 2 go together cause you have to use this to cut this.
   C: You have to use this (axe) to cut this (wood) too!

Case 4 [illegible]
1. M asks close-ended question
2. M asks open-ended question/prompts, cues-question form
3. M asks open-ended question/prompts, cues-question form
4. C asks question
   C gives answer
5. M uses positive reinf/praise/encour/agreement

1. M: Would you put the alligator, the lion and tiger together?
2. C: Yes
3. M: Why?
4. M: Tiger, lion and alligator, what do they do to you?
   C: Eat you?
5. M: Right.